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# Shape Memory Alloy Isolation Valves

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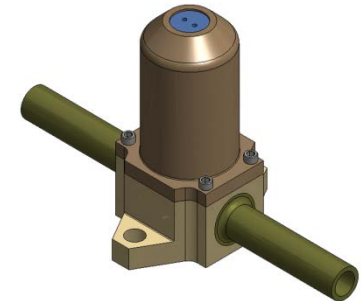
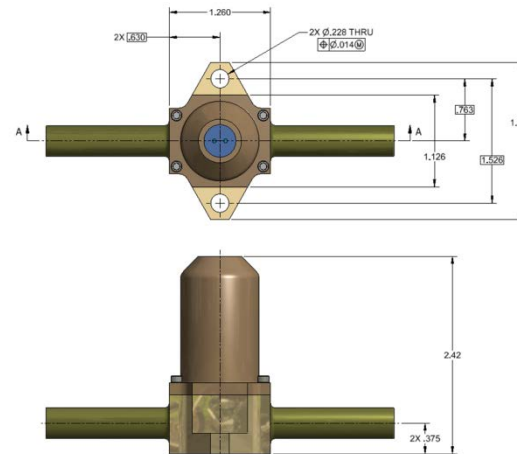
## MOTIVATION

- Existing propellant isolation systems such as pyrotechnic valves require special handling and have lifetimes (<10 yrs) shorter than typical operational spacecraft (15+ yrs)
- Shaped memory alloy isolation valves provide an intrinsically safe isolation system that increases lifetime >5x over SOTA and contain no explosives
- Long lived propellant isolation systems are required to passivate spacecraft propulsion at end of life (>15 yrs) to prevent orbital debris and comply with treaty obligations
- Reduced logistics requirements and intrinsically safe systems will produce industry wide savings

## TECHNICAL APPROACH

- Evaluate available isolation systems (pyrotechnic and latch valves) and determine optimal geometries and power levels
- Define system packaging and validate performance and safety margins within operational constraints
- Build, test, and qualify 3 variants; 5000 psi NC, 5000 psi NO, and propellant isolation 500 psi NC valves
- Flight qualify valves via extensive ground testing
- Partner with AF flight programs to demonstrate delivered units

## APPLYING AFRL TO SUSTAINMENT



Design of shape memory alloy isolation valve compatible with existing pyrotechnic valve electrical and mechanical interfaces

## PAYOFF/TRANSITION

- Shape memory alloy isolation valves will increase safety, storability and readiness for spacecraft with propulsion
- Eliminates life limitations of SOTA pyrotechnic valves
  - Intrinsically safe pressurant and propellant isolation
  - Enables high confidence propulsion passivation at EOL
  - Decreases costs logistics costs in testing and verification
  - Eliminates explosive hazards during launch ops
- Pervasive payoffs to satellites that use propulsion!